A REFRIGERATED ROOM FOR PRE-COOLING AND HOLDING PRODUCE.

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1. Prefabricated rooms are available but expensive.

2. Farmer constructed rooms are feasible and moderate in cost.

3. Costs are exceedingly variable due to types of material and labor employed. A rough estimate, however, should be useful. For small coolers holding from 500 to 2000 bushel crates the cost for building per bushel might be $1.50 and $0.50 for refrigeration making a total of $2. This is nearer correct for the 2000 bushel room and might be as much as 50 percent to 100 percent higher for the minimum sized storage suggested.

4. Whenever a room can be constructed within an existing building the costs will be reduced possibly by 50 percent.

5. Room size requirements depend on whether the room is to be used to pre-cool produce or to store produce as well. Growers must determine this for themselves and then calculate dimensions based on providing 2.5 cubic feet of volume per bushel at maximum loading. A grower may calculate room volume required by knowing the dimensions of the containers he uses or enter tables of approximate storage space required for various farm produce such as U.S.D.A. Separate from Agricultural Statistics, 1940 Number 40 entitled, "Approximate or average weights of various commodities and other conversion factors." This publication includes dimensions of containers used with fruits and vegetables.

6. Materials for construction are usually a matter of preference of the grower. A few suggestions might be found helpful. Wood is probably the most easily used. Masonry materials are very satisfactory and probably will have a longer life. Loose or granulated materials are frequently used for insulation and are satisfactory only if maintained in a dry condition by means of tightly installed unbroken and well sealed and lapped vapor seals. Plastic foam board types of insulation are highly recommended since they are moisture and vapor sealed, resistant to all deterioration and easily installed. Foamed glass is in this class. Costs installed are moderate. Four to 6 inches of insulation are commonly used in walls and ceiling and at least 2 inches in the floor. Plastic insulation may be installed with zinc coated nails with special washers or it may be applied with cement mortar or special mastic materials. It is preferable to erect this material in two layers overlapping all joints and especially at all junctions of walls with ceiling and floor.

7. Refrigerator doors may be constructed by a good carpenter, but it appears much wiser to purchase the door and frame ready for installation from specialists in the field. Directions for constructing such doors are available and no attempt to construct them should be made without these plans.

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8. Heat loads and sizing refrigeration equipment is so important that it is usually left up to the refrigeration contractor, who can then guarantee performance based on the growers maximum needs. It becomes even more important to know accurately the heat or cooling load when pre-cooling produce from the field is attempted in a matter of a few hours or minutes in the case of a hydrocooling installation. Some will be interested in how heat loads are calculated based on average conditions of product load, air leakage and space heat gain. The following table was prepared to aid in calculating the total heat load and is based on two assumptions, i.e., that if one calculates the heat gained by the room through the walls, floor, and ceiling and increases it by 20 percent this will take care of the product service load. Secondly, the total load is based on 16 hours of operating time per 24 hours. When this is done the refrigeration system will have sufficient excess capacity to handle the product load and air leakage in average use plus conducted heat gain.

Table (1). Heat Gain Factors for Determining Required Refrigeration Capacity.

Equivalent Cork Thickness (In)	U*	Heat Gain Factor- Btu per Hour per Square Foot of Surface Refrigerator at 35°F.**
2	0.1346	14.7
4	0.0711	7.7
6	0.048	5.2
8	0.037	4.0
10	0.029	3.1

* Overall heat transfer coefficient- Btu per hour per square foot per degree temperature difference. (A.S.H.V.E. Guide- 1950)

** Values determined for 95°F. outside temperature.

The calculation to determine the total heat load of any cold room then becomes one of determining the total area of the outside surfaces in square feet and multiplying it by the appropriate Heat Gain Factor in table 1. This gives a total required refrigeration system capacity in Btu per hour. A ton of refrigeration is equivalent to 12,000 Btu per hour of heat absorption.

Table (2) lists approximate capacities of condensing (refrigeration) units. Much of this information including the two tables has been taken from "Engineering Progress at the University of Florida" Vol. VI, No. 5, May 1952, published monthly by the Florida Engineering and Industrial Experiment Station, College of Engineering, University of Florida, Gainesville, and being Bulletin Series No. 53 on the subject, "Construction of Refrigerators and Freezers," by James T. Leggett.

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Table (2). Approximate Capacities of Condensing Units

(Refrigerant is Freon 12)

Type of Condensing Unit	Horsepower of Unit	Btu per Hour Capacity	
		at 0°F. Freezer	at 35°F. Refrigerator
Air-cooled	1/4	1000	1980
	1/3	1690	3600
	1/2	2480	5000
	3/4	3720	6700
	1	5600	10200
	1 1/2	7700	13100
	2	10250	16750
	3	12200	20950
Water-cooled	1/3	1860	4100
	1/2	2950	5720
	3/4	4450	8800
	1	7000	13850
	1 1/2	9775	17500
	2	13200	24500
	3	16300	30000
	5	24660	48000

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